

duction and oxidation of organic compounds of arsenic; S. Reich, Nitration of phenylpropionic acid; P. Dutoit, On the mechanism of the formation of certain precipitates; E. Briner, On the formation and the decomposition of the metallic carbures; O. Kaiser, On the hydrocarbons in coal; M. Duboux, On a differential calorimeter; G. de Montmollin and O. Billeter, The action of cyanide of benzene-sulphonyl on sulphuretted compounds; A. Pictet and T. O. Chou, Direct formation of alkaloids starting with albumines; L. Pelet, On the theory of dyeing.

(5) *Botany*.—A. Ernst, Researches into *Chara crinata*; C. Schroter, Recent researches in botanic geography in North America; P. Jaccard, On the distribution of medullar rays in the conifers; B. P. G. Hochreutiner, On certain new species of Malvaceæ; G. Senn, The distribution of chromotophores in marine algæ; E. Kelhofer, Wooded and cultivated parts of the Jura near Schaffhausen; M. Rikli, The flora of Crete; A. Trondle, On the permeability of the tip of the root; M. Jäggli, The delta of the Maggia and its vegetation; J. Briquet, The vegetable parts of the Cruciferae sempervivoides.

(6) *Zoology*.—Dr. Thomas, A critical study of mountain sickness; P. Revilliod, Preliminary note on the osteology of the fossil Chiroptera in Tertiary beds; J. Roux, The family of the Atyidae; E. A. Göldi, Comparative development in the sexual reproduction of plants and animals; A. Oswald, On the action of the glands of internal secretion on the circulation; A. Burdet, The birds of the island of Texel, Holland; O. E. Imhof, The molluscs of our Alpine lakes; H. Blanc, Contribution to the anatomy of *Chlamydomorphus truncatus*; L. Ascher, (a) The factors determining the internal secretion of the glandula suprarenales, (b) the innervation of the liver; (c) the acoustic properties of the canales semi-circulares; A. Lipschütz, The importance of physiology in the study of development; E. Yung, The effects of inanition on the cell; A. Gandolfi, Observations on the distribution of *Daphnia hyalina* in the Lake Lemano; E. André, The balantidium of the amphibians.

(7) *Entomology*.—C. Emery, History of an experimental society of amazon ants; J. L. Reverdin, Revision of the palæoarctic species *Hesperia*; E. A. Göldi, New discoveries in the origin of sex, the determination of sex, and the proportion of the sexes in insect states, particularly in the cases of the honey-bee and the neotropical ants; F. Ris, Census of the Swiss Plecoptera by F. J. Pictet in 1841 and nowadays; O. Schneider-Orelli, On the biology of *Phylloxera vastatrix*; F. Brocher, The circulation of the blood in the wings of the Dyticidae; C. Ferrière, The utilisation of insects which eat other insects; H. Faes, On the value of the powder of pyrethra obtained from indigenous plants for insecticide purposes; A. Pictet, Hereditary and individual reactions in insects.

(8) *Anthropology and Ethnography*.—Dr. Lardy, The grotto of Cotanchere; H. Lagotale, Study of a hundred Genevese femurs; Dr. Montandon, The instruments of music in the ethnographic museum at Geneva; R. Montandon, The handling of stones at the Mousterian station of Rebières; Prof. Schlaginhausen, The Neolithic lake-dwellings of Eglolzwil; E. Matthias, The influence of physical exercise on growth; A. Schultz, New projective measurements of the skull; H. Hoessly, Craniological investigations among the east Eskimos, after the Greenland expedition of 1912; A. Cartier, The chief discoveries at the Magdalenian station of Veyrier; E. Pittard, Castration and the morphological modifications which it causes in man.

On September 13 and 15 lectures were given to the assembled society in the Aula of the University.

Prof. Emile Yung, the eminent Genevan zoologist, gave an interesting account of the first century of the society, and laid before the meeting the *Livre du centenaire*. The venerable geologist, Prof. Albert Heim, the friend of Forel, spoke on fresh light in the investigation of the Jura Mountains; Prof. P. L. Mercanton, of Lausanne, reported on forty years' mensuration of the Rhone glacier; Dr. Fritz Sarasin, of Basel, the well-known traveller and archæologist, gave a lecture, with lantern-slides, on an archipelago in the Pacific Ocean—the Loyalty Isles; and Dr. E. Rübel, of Zürich, spoke of the international botano-geographic expedition to North America, also with magic lantern. But the most remarkable was the opening discourse of the president, Prof. Amé Pictet, of Geneva. It dealt with molecular structure and its influence on life and death. What, he asks, is it that renders matter living? And, again, what is it that renders some matter injurious and some harmless or beneficial? To study these profound questions, Prof. Pictet turns to the vegetable world, as more fundamental in the scale of life than the more dependent animal realm. It is the plants, indeed, that are able to perform the synthesis of organic substances on which all life seems to depend. In the vegetable world it is the group of poisons known as the alkaloids which have yielded up their secret to Prof. Pictet's patient study. His theory is that it is to the molecular constitution that we must look. It has been shown that all the organic compounds known belong to two types of molecular structure: (1) open chains, and (2) closed chains. These two classes of compounds are separated by a great gulf; but it is not impassable. The passage from the open to the closed chain can be effected with comparative ease by means of chemical reactions, but the reverse process is difficult. The closed chain is a very stable molecular form, and this it is which Prof. Pictet connects with death. Life is, roughly speaking, the passage of all open chains to the closed form. Such closed chains may be, and indeed must be, formed from time to time in the organism, and constitute the life in death, from which the animal tries to free itself by excretion. The plant cannot do this, but it protects itself internally from these dangerous products. Such are the essential oils, turpentine, and camphors, which constitute so many of our perfumes; such, again, are the caoutchoucs and tannins, the vegetable colouring matters, and the deadly poisons hidden in various plants. These, Prof. Pictet tells us, are products of denutrition; they are like our so-much-talked-of uric acid. We find them, not in the living cell, but packed away in dead cells, and often wrapped round with protecting covers to prevent them from harming the living plant. Thus, he concluded, the serpent who bites his own tail, which was the symbol of eternity with the ancients, deserves to become for the modern biochemist the symbol of death.

GRACE CHISHOLM YOUNG.

THE CONCH SHELL OF INDIA.¹

THE conch or chank shell (*Turbinella pyrum*) is so intimately connected with the religious and social life of the people of India that the monograph on the subject prepared by Mr. J. Hornell, Superintendent of Pearl and Chank Fisheries to the Government of Madras, is welcome. He has gained in the course of his official duties a knowledge of the industry in Madras, and he was recently deputed by

¹ Madras Fisheries Bureau. Bulletin No. 7. "The Sacred Chank of India: A Monograph of the Indian Conch (*Turbinella pyrum*). By J. Hornell. Pp. viii+181+18 plates. (Madras: Government Press, 1914.) Price 3s.

the Government of that province to investigate its conditions in other parts of the country.

Among the five areas in which the shells are collected—Tinnevely, usually known as the Tuticorin fishery, Ramnad, the Carnatic Coast, Travancore, and Kathiawar—the first is the only place where it is carried on systematically, and it has existed here for at least 1800 years. Early evidence of the use of the shell is found in the Foote collection of Indian prehistoric antiquities in the Madras Government Museum, and more recent excavations, conducted by Mr. A. Rea, have furnished additional examples. In Mysore the specimens have been supposed to date back to Neolithic times, but as the shells cannot be worked without a metal saw, they probably belong to a later age, that of iron.

In Tinnevely, where the industry is carried on under official superintendence, about seventy divers are employed. In favourable circumstances, a diver may in each excursion to the beds make twenty-five descents, each yielding from nothing to eight shells. These on reaching the shore are classified in nine grades, ranging from 4 to $2\frac{1}{2}$ inches in diameter; the wormed shells, being of inferior value, are placed in a special category.

The chief economical value of the shell is for the production of bangles or bracelets, the object of wearing them being partly for purposes of ornament, partly as a protective against evil spirits and the evil eye. While the source of supply is mainly southern India, the manufacture of bangles is now practically confined to Bengal. Mr. Hornell suggests that this transference of the manufacture took place in the fourteenth century, which marks the downfall of Hindu supremacy in the south, when the rich cities of the Pandyan kingdom were sacked by the Mahomedans, and the coast trade passed into Arab hands. At the present day the shells are imported to Calcutta, and pass thence to Dacca and other centres in Bengal, where they are cut by the Sankhari caste, which holds a high place in the Hindu social system. The wearing of chank bangles is now virtually confined to Lower Bengal and the hill tribes north and east of the province, from the Santals to the tribes of Assam and Manipur, and from the Sunderbuns to the Himalayas and the Tibetan plateau. Some $2\frac{1}{2}$ million shells appear to be worked up annually in Bengal. The columella is first extracted by sawing off a slice of the lip and smashing the apex. The sawyer sits on an earthen floor tightly wedged between two short wooden stakes driven into the ground, one supporting his back and his toes against the other. He presses with one foot a disc of hard wood against the mouth aperture and divides the shell into sections with a heavy saw, the blade of which is in the form of a crescent ending in a hook at each end. The use of any more elaborate machinery is unknown. He is paid about one rupee for every ten shells he cuts. The work is very fatiguing, owing to the constrained position of the artificer.

Besides being cut into bangles, the shell supplies other forms of ornament, rings, necklaces, coat or dress buttons being made from it. Up to quite recent times these shells were used as currency in the Naga Hills. Some of the fragments are burned into a fine lime, used for industrial purposes and as a cure for various diseases, such as rickets, asthma, and cough. This is justified by modern medical research, the lime being useful to strengthen the bones of rickety children or by the deposit of salts round tuberculous centres. A minor use of the shell is to supply the equivalent of our infants' feeding-bottles.

Besides these economical uses of the shell, it is employed in various ways connected with the religious

and social life of the Hindus. It is the emblem of the god Vishnu, and when the convolutions take the sinistral or left-hand form it is highly valued, and deposited in temples of the god. The four daily services at a Hindu temple are announced by blowing the shell, which in ancient times was also used as a war trumpet. No one who has encamped near a Hindu temple will forget the weird muffled roar which calls the god to wake at early dawn and receive the service of his worshippers. Beggars blow the shell as an appeal for alms. It is specially valued as a protective against the evil eye, and hence water is poured from it on the foundation-stone of a temple or house, or it is hung round the necks of children or cattle. It is blown at harvest when a man undergoes a special purification and is sent to cut the first-fruits, and at marriages to scare the evil spirits which beset bride and bridegroom. With the same object it is sounded when a corpse is being carried to the funeral pyre or to the burial ground.

On the whole, this survey of one of the purely indigenous industries of the country, the products of which are all locally absorbed, is of sufficient interest to justify the labour which Mr. Hornell has undertaken in collecting the materials for his excellent monograph.

LUMINOUS INSECTS.¹

THE power of emitting light at night is a property that has been developed to varying extent in many different branches of the animal kingdom. We find it, for instance, in the Protozoa, *e.g.* *Noctiluca*, an organism which, though microscopic in size, is sometimes present in such countless millions on the surface waters of the ocean as to make the whole sea appear to be ablaze with a pale, cold, "phosphorescent" light. Higher in the animal scale we find the property well developed in the Hydrozoa, *e.g.* *Pyrosoma*, a colonial oceanic form. We have it again in numerous molluscs, in the insects, and even in the vertebrates, a large number of the fish that inhabit the abysmal depths of ocean, where the sun's rays can never penetrate, carrying their own lamps disposed about their bodies in patterns that vary according to the species. Here, however, I propose to consider only the insects that exhibit this power.

There is, as might be expected considering the striking nature of the phenomena in question, a very extensive literature on the subject. This is for the most part scattered throughout numerous scientific periodicals, but the earliest part of it, up to 1887, has been collected together by Gadeau de Kerville in his "Insects Phosphorescents," published in that year.

It is rather remarkable that the beetles (Coleoptera) have almost a monopoly of light emission amongst insects, and even here the property is almost confined to two families. The first, and by far the most important of these, for our consideration, is the Lampyridæ, or, to give them their popular name, the glow-worms and fireflies. With them are associated one or two small closely allied families, the Phengodidæ, Rhagophthalmidæ, etc., some of which are as yet very imperfectly known and unsatisfactorily characterised. In the Lampyridæ proper the luminous organs, when present, are generally found in both sexes, though frequently more strongly developed in one than in the other, and are situated in the terminal or subterminal segments of the abdomen, the light being shown from the ventral surface.

All members of this society are familiar with the glow-worm of this country, *Lampyris noctiluca*. I

¹ From a paper read before the South London Entomological and Natural History Society by K. G. Blair.